MATHEMATICS-IX

Module - 4

INDEX

TRIANGLES

Congurence:- "Equal in all respect or figures whose shape & sizes are both the same"

1. Two triangle are congruent if and only if their corresponding sides and the corresponding angles are equal.

2. Angles opposite to two equal sides of a triangle are equal.

3. If two angles of a triangle are equal, then the sides opposite to them are also equal.

TWO TRIANGLES ARE CONGRUENT IF

(i) Two sides and the included angle of one are equal to the corresponding sides and the included angle of the other triangle. (SAS)

(ii) Two angles and the included side of one triangle are equal to the corresponding two angles and the included side of the other triangle. (ASA)

(iii) If any two angles and a non-included side of one triangle are equal to the corresponding angles and side of another triangle then the two triangles are congruent. (AAS)

(iv) Two triangle are congruent if the three sides of one triangle are equal to the corresponding three sides of the other triangle.

(v) Two right triangles are congruent if the hypotenuse and one side of one triangle are respectively equal to the hypotenuse and one side of the other triangle.

INEQUILITIES OF TRIANGLE

(i) If two sides of a triangle are unequal, the longer side has greater angle opposite to it.

(ii) In a triangle the greater angle has the longer side oppsite to it.

(iii) The sum of any two sides of a triangle is greater than the third side.

IN A TRIANGLE

(i) Orthocenter is the point of intersection of the altitudes.

(ii) Circumcentre is the point of intersection of the perpendicular bisectors of the sides.

(iii) In centre is the point of intersection of the angular bisectors.

(iv) Centroid is the point of intersection of the medians.

(v) The circumcentre of a triangle is equidistant from its vertices.

(vi) The in centre of a triangle is equidistant from its sides.

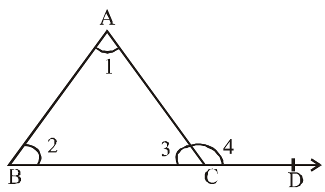
(vii) The centroid divides a median in the ratio 2 : 1.

(viii) The orthocentre of a right angled triangle lies at the vertex containing the right angle.

USEFUL FACTS FOR SOLVING PROBLEMS ON TRIANGLES

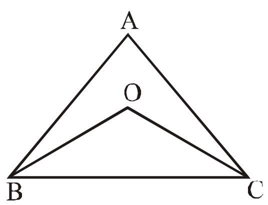
(i) The sum of all the angles of a triangle is 180°:
$\angle 1 + \angle 2 + \angle 3 = 180^\circ$

(ii) If one side of a triangle is produced then the exterior angle so formed is equal to the sum of two interior opposite angles.
$\angle 4 = \angle 1 + \angle 2$



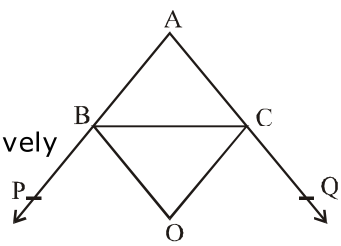
(iii) If the three sides of a triangle be produced in order, then the sum of all the exterior angles so formed is 360°.

(iv) In a ΔABC, if the bisectors of $\angle$B and $\angle$C meet at point O, then



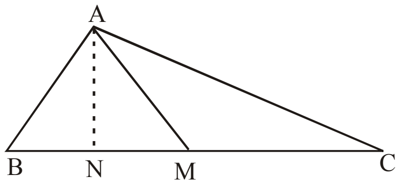
$\angle BOC = 90^\circ + \frac{1}{2}\angle A$

(v) In ΔABC, if sides AB and AC are produced to P and Q respectively and the bisectors of $\angle$PBC and $\angle$QCB intersect at Q, then



$\angle BOC = 90^\circ - \frac{1}{2}\angle A$

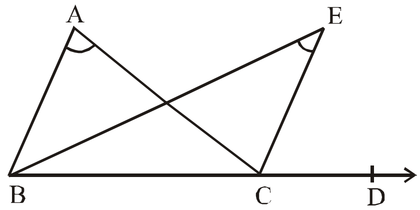
(vi) In ΔABC, if AM is the bisector of $\angle BAC$ and $AN \perp BC$, then



$\angle MAN = \frac{1}{2}(\angle B - \angle C)$

(vii) In a ΔABC, if side BC is produced to D and bisectors of $\angle ABC$ and $\angle ACD$ meet at E, then

$\angle BEC = \frac{1}{2}\angle A$



Notes

(i) Angles opposite to two equal sides of a triangle are equal.

(ii) If D is the mid-point of the hypotenuse AC of a right triangle ABC, then BD = $\frac{1}{2}$ AC.

(iii) If ΔABC, is isosceles triangle then :

(a) Altitude AD bisects BC.

(b) Median AD is perpendicular to the base BC.

(iv) If two angles of a triangle are equal, then sides opposite to them are also equal.

(v) If the altitude from one vertex of a triangle bisects the opposite side, then the triangle is isosceles.

(vi) If the altitudes from two vertices of a triangle to the opposite sides are equal, then the triangle is isosceles.

(vii) Two right triangles are congruent if the hypotenuse and one side of one triangle are respectively equal to the hypotenuse and one side of the other triangle. (RHS)

(viii) If the altitudes AD, BE and CF of ΔABC are equal, then the triangle is equilateral.

(ix) If two sides of a triangle are unequal, the longer side has greater angle opposite to it.

(x) The sum of any two sides of a triangle is greater than the third side.

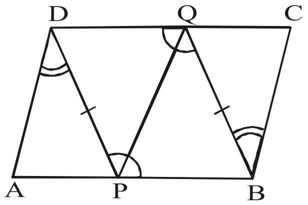
(xi) Of all the line segments that can be drawn to a given line, from a point, not lying on it, the perpendicular line segment is the shortest.

(xii) In a triangle, sum of the three altitudes of a triangle is less than the sum of three sides of a triangle.

(xiii) In a triangle, perimeter of a triangle is greater than the sum of its three medians.

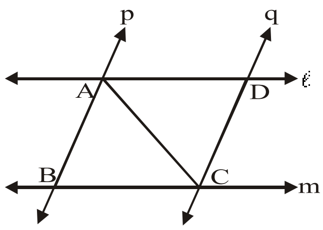
SOLVED PROBLEMS

Ex.1 In fig, DP = BQ, $\angle DPB = \angle BQD$ and $\angle ADP = \angle CBQ$. Show that $\Delta ADP \cong \Delta CBQ$.



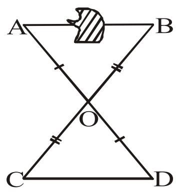
Sol. [Hint : $\angle DPB = \angle BQD$
$\Rightarrow 180° - \angle DPB = 180° - \angle BQD$
$\Rightarrow \angle APD = \angle CQB$]

Ex.2 ℓ and m are two parallel lines intersected by another pair of parallel lines p and q. Show that $\Delta ABC \cong \Delta CDA$.



Sol. [Hint : (i) $\angle BAC = \angle DCA$
(ii) $\angle ACB = \angle CAD$
(iii) AC = CA]

Ex.3 Ram wishes to determine the distance between two objects A and B, but there is an obstacle between these two objects as shown in fig, which prevents him from making a direct measurement. He devises an ingenious way to overcome

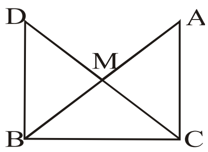


this difficulty. First, he fixes a pole at a convenient point O so that from O, both A and B are visible. Then, he fixes another pole at the point D on the line AO (produced) such that AO = DO. In a similar way, he fixes a third pole at the point C on the line BO (produced) such that BO = CO. Then he measures CD and finds that CD = 170 m. Prove that the distance between the object A and B is also 170 m.

Sol. [Hint : $\Delta AOB \cong \Delta DOC$ by SAS cong]

Ex.4 In right triangle ABC, right angled at C, M is the mid-point of hypotenuse AB. C is joined to M and produced to a point D such that DM = CM. Point D is joined to point B. Show that :

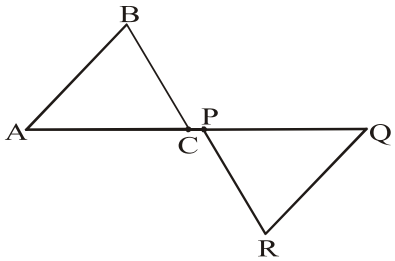
(i) $\Delta AMC \cong \Delta BMD$
(ii) $\angle DBC$ is a right angle.
(iii) $\Delta DBC \cong \Delta ACB$
(iv) CM = $\frac{1}{2}$ AB.



Sol. [Hint : (i) By SAS congruence rule, $\Delta AMC \cong \Delta BMD$
(ii) $\angle ACM = \angle BDM$ (CPCT)
$\Rightarrow CA || BD$
$\Rightarrow \angle BCA + \angle DBC = 180°$
$\Rightarrow \angle DBC = 90°$
(iii) By SAS congruence rule, $\Delta DBC \cong \Delta ACB$
(iv) $\Delta DBC \cong \Delta ACB \Rightarrow CD = AB$

$\Delta AMC \cong \Delta BMD \Rightarrow CM = DM \Rightarrow CM = \frac{1}{2} CD \quad \Rightarrow CM = \frac{1}{2} AB$

Ex.5 In fig AB||QR, BC||PR and AC = PQ. Prove that $\Delta ABC \cong \Delta QRP$.

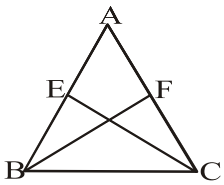


Sol. [Hint : $\angle BAC = \angle RQP$ (alternate interior angles)

AC = PQ

$\angle BCA = \angle RPQ$ (alternate exterior angles)]

Ex.6 E and F are respectively the mid-points of equal sides AB and AC of ΔABC. Show that BF = CE.



Sol. In ΔABC, AB = AC (Given)

E and F are respectively the mid-points of the sides AB and AC.

Now BE = $\frac{1}{2}$AB

and CF = $\frac{1}{2}$AC

We know that halves of the equal sides are equal.

Therefore, BE = CF ...(1)

Now, for ΔABF and ΔACE, we have

AB = AC (Given)

$\angle BAF = \angle CAE$ (Each = $\angle A$)

BE = CF (By 1)

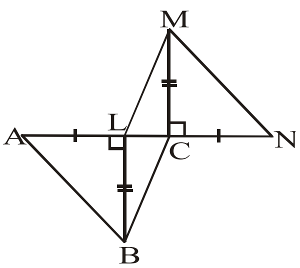
Thus, we conclude that

$\Delta ABF \cong \Delta ACE$

(SAS congruence criteria)

Therefore, BF = CE. (By CPCT)

Ex.7 In fig, BL $\perp$ AC, MC $\perp$ LN, AL = CN and BL = CM. Prove that $\Delta ABC \cong \Delta NML$.



Sol. In Δs ALB and NCM,

AL = CN (Given)

BL = CM (Given)

$\angle ALB = \angle NCM$ (Each = 90°)

Therefore, by SAS congruency, we have

$\Delta ALB \cong \Delta NCM$

$\Rightarrow$ AB = NM ...(1)

In ΔBLC and ΔMCL,

BL = CM (Given)

CL = CL (Common)

$\angle$BCL = $\angle$MCL (Each = 90º)

Therefore, SAS congruency, we have

$\Delta BCL \cong \Delta MCL$

$\Rightarrow$ BC = ML ..(2)

Also, AL = CN (Given)

$\Rightarrow$ AL + LC = LC + CN

$\Rightarrow$ AC = NL ..(3)

Now, in Δs ABC and NML,

AB = NM (By 1)

BC = ML (By 2)

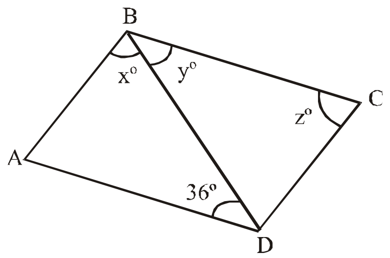
and AC = NL (By 3)

Therefore, by SSS congruence, we have

$\Delta ABC \cong \Delta NML$

Ex.8 In Fig., AB || DC. If $x = \frac{4}{3}y$ and $y = \frac{3}{8}z$, find $\angle$BCD, $\angle$ABC and $\angle$BAD?

Sol Since AB || DC and transversal BD intersects them at B and D respectively. Therefore,



$\angle$ABD = $\angle$BDC [Alternate angles]

and $\angle$CBD = $\angle$ADB

$\Rightarrow$ $\angle$BDC = xº and y = 36º

[$\because$ $\angle$ABD = xº and $\angle$ADB = 36° (Given)]

But, it is given that : $x = \frac{4}{3}$ y and

$y = \frac{3}{8}$ z

$\therefore$ $x = \frac{4}{3} \times 36$ and $36 = \frac{3}{8}$ z

$\Rightarrow$ x = 48 and $z = \frac{36 \times 8}{3} = 96$

Now, in Δ BAD, we have

$\angle$BAD + $\angle$ADB + $\angle$ABD = 180º

$\Rightarrow$ $\angle$BAD + 36º + xº = 180º

$\Rightarrow$ $\angle$BAD + 36° + 48º = 180º

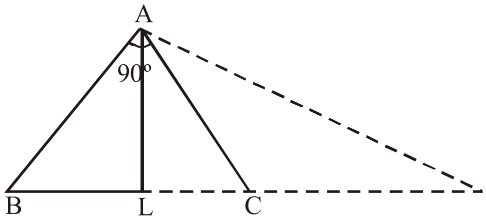
$\Rightarrow$ $\angle$BAD = 96º

Thus, $\angle$BCD = zº = 96º,

$\angle$ABC = x° + yº = 48º + 36º = 84º and $\angle$BAD = 96º.

Ex.9 A triangle ABC is right angled at A. AL is drawn perpendicular to BC. Prove that $\angle BAL = \angle ACB$.

Sol. In Δ ABL, we have



$\angle BAL + \angle ALB + \angle B = 180^o$

$\Rightarrow \angle BAL + 90^o + \angle B = 180^o$ $\therefore$ $\angle ALB = 90^o$]

$\Rightarrow \angle BAL + \angle B = 90^o$

$\Rightarrow \angle BAL = 90^o - \angle B$ ...(i)

In Δ ABC, we have

$\angle A + \angle B + \angle C = 180^o$

$\Rightarrow 90^o + \angle B + \angle C = 180^o$

$\Rightarrow \angle B + \angle C = 180^o - 90^o$

$\Rightarrow \angle B + \angle C = 90^o$

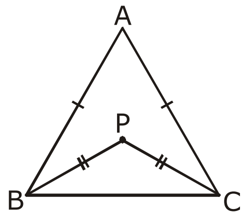
$\Rightarrow \angle C = 90^o - \angle B$

$\Rightarrow \angle ACB = 90^o - \angle B$ ...(ii)

From (i) and (ii), we get

$\angle BAL = \angle ACB$.

Ex.10 In figure AB = AC and PB = PC. Prove that $\angle ABP = \angle ACP$.



Sol. In ΔABC, we are given that,

AB = AC

$\Rightarrow$ $\angle ABC = \angle ACB$ ...(1)

Also, in ΔABC, we have

PB = PC

$\Rightarrow$ $\angle PBC = \angle PCB$ ...(2)

Subtracting (2) from (1),

$\angle ABC - \angle PBC = \angle ACB - \angle PCB$

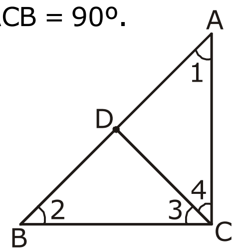
$\Rightarrow$ $\{\angle ABP + \angle PBC\} - \angle PBC = \{\angle ACP + \angle PCB\} - \angle PCB$

$\Rightarrow$ $\angle ABP = \angle ACP$

Hence, we have

$\angle ABP = \angle ACP$.

Ex.11 In figure DA = DB = DC. Show that $\angle ACB = 90^o$.



Sol. In ΔDAC

$DA = DC$ (Given)

$\Rightarrow \angle 1 = \angle 4$

(Angles opposite to equal sides are equal)

In ΔDBC, $DB = DC$ (Given)

$\Rightarrow \angle 2 = \angle 3$

Then, $\angle 1 + \angle 2 = \angle 3 + \angle 4$

i.e., $\angle 1 + \angle 2 = \angle ACB$

Also, In ΔABC, we have

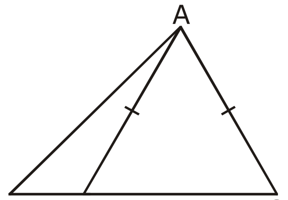
$\angle 1 + \angle 2 + \angle ACB = 180^o$

$\Rightarrow \angle ACB + \angle ACB = 180^o$

i.e. $2 \times \angle ACB = 180^o$

Therefore, $\angle ACB = 90^o$

Ex.12 In figure D is a point on the side BC of ΔABC such that AD = AC. Show that AB > AD.



Sol. In ΔADC, $AD = AC$ $\Rightarrow$ $\angle ADC = \angle ACD$ ...(1)

(Angles opposite to equal side are equal)

Now, $\angle ADC > \angle ABD$ ...(2)

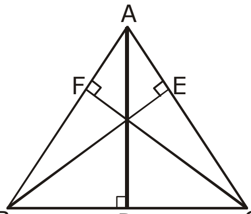
$\left\{\because \begin{array}{l}\text{An exterior angle of a triangle is}\\ \text{greater than an opposite interior angle}\end{array}\right\}$ From (1) and (2) $\angle ACD > \angle ABD$

i.e., $\angle ACB > \angle ABC$ [on produce]

i.e., In ΔABC, $\angle C > \angle B$

$\Rightarrow$ $AB > AC$ (By property 7.4) $\Rightarrow$ $AB > AD$ ($\because$ AC = AD)

Ex.13 Show that the perimeter of a triangle is greater than the sum of the length of the three altitudes of the triangle.



Sol. In ΔABC, AD, BE and CF are three altitude.

In right angled ΔABD, AB is hypotenuse.

$\Rightarrow AB > AD$

Similarly, in right angled ΔBEC and ΔCFA, we have

$BC > BE$

and $CA > CF$

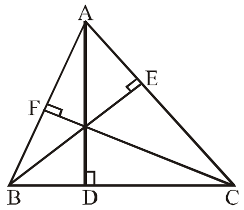
Adding (1), (2), (3)

$AB + BC + CA > AD + BE + CF$

i.e., Perimeter of $\Delta ABC > (AD + BE + CF)$

Ex.14 Show that the sum of the three altitudes of a triangle is less than the sum of three sides of the tirangle.

Sol. **Given :** A ΔABC in which $AD \perp BC$, $BE \perp AC$ and $CF \perp AB$.



To prove : AD + BE + CF < AB + BC + AC.

Prove : We know that of all the segments that can be drawn to a given line, from a point not lying on it, the perpendicular line segment is the shortest.

Therefore,

$AD \perp BC \Rightarrow AB > AD$ and $AC > AD$

$\Rightarrow \quad AB + AC > AD + AD$

$\Rightarrow \quad AB + AC > 2\ AD$ ..(i)

$BE \perp AC \Rightarrow BC > BE$ and $BA > BE$

$\Rightarrow \quad BC + BA > BE + BE$

$\Rightarrow \quad BA + BC > 2\ BE$ ..(ii)

And, $CF \perp AB \Rightarrow AC > CF$ and $BC > CF$

$\Rightarrow \quad AC + BC > 2\ CF$ ..(iii)

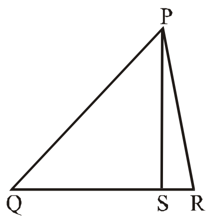
Adding (i), (ii) and (iii), we get

$(AB + AC) + (AB + BC) + (AC + BC) > 2\ AD + 2\ BE + 2\ CF$

$\Rightarrow \quad 2\ (AB + BC + AC) > 2\ (AD + BE + CF)$

$\Rightarrow \quad AD + BE + CF < AB + BC + AC$

Ex.15 In ΔPQR, S is any point on the side QR. Show that PQ + QR + RP > 2 PS.



Sol. In ΔPQS, we have

$PQ + QS > PS$ ..(i)

[$\because$ Sum of the two sides of a Δ is greater than the third side]

Similarly, in ΔPRS, we have

$RP + RS > PS$ ..(ii)

Adding (i) and (ii), we get

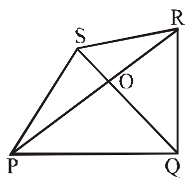
$(PQ + QS) + (RP + RS) > PS + PS$

$\Rightarrow \quad PQ + (QS + RS) + RP > 2\ PS$

$\Rightarrow \quad PQ + QR + RP > 2\ PS$

[$\because QS + RS = QR$]

Ex.16 In Fig. PQRS is a quadrilateral in which diagonals PR and QS intersect in O.



Show that :

(1) PQ + QR + RS + SP > PR + QS

(2) PQ + QR + RS + SP < 2 (PR + QS)

Sol. Since the sum of any two sides of a triangle is greater than the third side.
Therefore, in ΔPQR, we have

$PQ + QR > PR$ ..(i)

In Δ RSP, we have

$RS + SP > PR$ ..(ii)

In ΔPQS, we have

$PQ + SP > QS$ ..(iii)

In ΔQRS, we have

$QR + RS > QS$ ..(iv)

Adding (i), (ii), (iii) and (iv), we get

$2 (PQ + QR + RS + SP) > 2 (PR + QS)$

$\Rightarrow PQ + QR + RS + SP > PR + QS.$

This proves (1).

Now, In ΔOPQ, we have

$OP + OQ > PQ$ ..(v)

In ΔOQR, we have

$OQ + OR > QR$ ..(vi)

In ΔORS, we have

$OR + OS > RS$ ..(vii)

In ΔOSP, we have

$OS + OP > SP$ ..(viii)

Adding (v), (vi), (vii) and (viii), we get

$2 (OP + OQ + OR + OS) > PQ + QR + RS + SP$

$\Rightarrow 2 \{(OP + OR) + (OQ + OS)\} > PQ + QR + RS + SP$

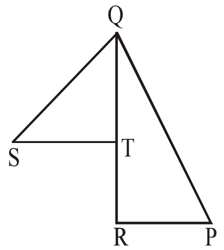
$\Rightarrow 2 (PQ + QS) > PQ + QR + RS + SP$

$\left[\begin{array}{l}\because OP + OR = PR \\ \text{and } OQ + OS = QS\end{array}\right]$

$\Rightarrow PQ + QR + RS + SP < 2 (PR + QS)$

This proves (2).

Ex.17 In Fig. T is a point on side QR of ΔPQR and S is a point such that RT = ST.



Prove that PQ + PR > QS.

Sol. In ΔPQR, we have

$PQ + PR > QR$

$\Rightarrow PQ + PR > QT + RT$ $[\because QR = QT + RT]$

$\Rightarrow PQ + PR > QT + ST$ ..(i)

$[\because RT = ST$ (Given)]

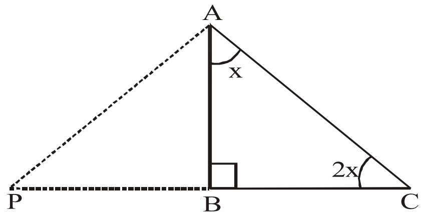
In ΔQST, we have

$QT + ST > QS$ ..(ii)

From (i) and (ii), we get

$PQ + PR > QS.$

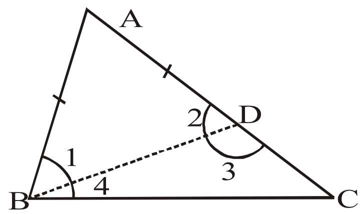
Ex.18 In a right angled triangle, one acute angle is double the other. Prove that the hypotenuse is double the smallest side.



Sol. Given : A right angled ΔABC with $\angle ABC = 90°$,
$\angle BAC = x$ and $\angle BCA = 2x$.
To prove : $CA = 2BC$.
Construction : Produce CB to point P such that BP = BC. Join PA.
Proof :
In ΔABP and ΔABC
$BP = BC$ [$\because$ By construction]
$\angle ABP = \angle ABC$ [$\because$ Each = 90°]
$AB = AB$ [$\because$ Common]
$\therefore \Delta ABP \cong \Delta ABC$ By SAS criteria
$PA = CA$ by C.P.C.T. ....(1)
Now, $\angle PAB = \angle BAC = x$ by C.P.C.T. [Let]
$\Rightarrow \angle PAC = x + x = 2x$
$PA = PC$ [$\because \angle PAC = \angle PCA = 2x$]
$\Rightarrow PA = 2BC$ [$\because BP = BC$] ......(2)
$CA = 2BC$ From (1) and (2)
Hence, proved.

Ex.19 Show that the difference of any two sides of a triangle is less than the third side.

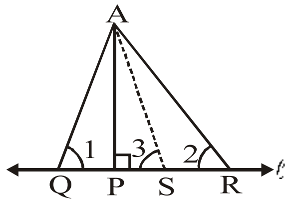
Sol. Given : A ΔABC



To prove : (i) $AC - AB < BC$
(ii) $BC - AC < AB$
(iii) $BC - AB < AC$
Construction : Take a point D on AC such that AD = AB. Join BD.
Proof :
$\angle 3 > \angle 1$ [$\because$ Ext. $\angle$ of a Δ is greater than each of int. opp. $\angle$s] ......(1)
$\angle 2 > \angle 4$ [$\because$ Ext. $\angle$ of a Δ is greater than each of int. opp. $\angle$s] ......(2)
$\angle 2 = \angle 1$ [$\because$ By construction AB = AD] .....(3)
$\angle 3 > \angle 1 = \angle 2 > \angle 4$ From (1), (2) and (3)
$\Rightarrow \angle 3 > \angle 4$ ......(4)
$\Rightarrow BC > CD$ [$\because$ Side opp. to greater angle is larger] .....(5)
or $CD < BC$
$\Rightarrow AC - AD < BC$
$\Rightarrow AC - AB < BC$ [$\because$ By construction AB = AD]
Similarly, $BC - AC < AB$ and $BC - AB < AC$.
Hence, proved.

Ex.20 In fig. AP $\perp \ell$ and PR > PQ. Show that AR > AQ.

Sol. Given : In fig. AP $\perp \ell$ and PR > PQ.



To prove : AR > AQ.

Construction : Mark a point S on PR such that PS = PQ. Join AS.

Proof :

In ΔAPQ and ΔAPS

AP = AP [$\because$Common]

$\angle$APQ = $\angle$APS [$\because$Each = 90°]

PQ = PS [$\because$By construction]

ΔAPQ $\cong$ ΔAPS. By SAS criteria

$\angle$1 = $\angle$3 by C.P.C.T. .....(1)

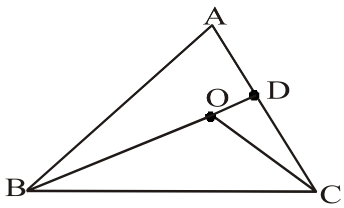
$\angle$3 > $\angle$2 [$\because$Ext. $\angle$ of a Δ is greater than each of int. opp. $\angle$s] .....(2)

$\angle$1 > $\angle$2 From (1) and (2)

$\Rightarrow$ AR > AQ [$\because$Side opp. to greater angle is larger.]

Hence, proved.

Ex.21 In fig, O is an interior point of ΔABC. BO meets AC at D. Show that OB + OC < AB + AC.



Sol. Given : O is an interior point of ΔABC. BO meets AC at D.

To prove : OB + OC < AB + AC

Proof :

In ΔABD, AB + AD > BD [$\because$Sum of two sides of a Δ is greater than the third side]

$\Rightarrow$ AB + AD > BO + OD .....(1)

In ΔCOD, OD + DC > OC .....(2)

[$\because$Sum of two sides of a Δ is greater than the third side]

AB + AD + OD + DC > BO + OD + OC [$\because$Adding (1) and (2)]

$\Rightarrow$ AB + AD + DC > BO + OC

$\Rightarrow$ AB + (AD + DC) > OB + OC

$\Rightarrow$ AB + AC > OB + OC

or OB + OC < AB + AC.

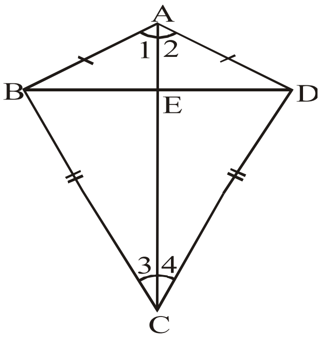
Hence, proved.

EXERCISE - I UNSOLVED PROBLEM

Q.1 In the fig. ABCD is a quadrilateral in which AB = AD and BC = DC. Prove that :

(i) AC bisects each of the angles A and C.

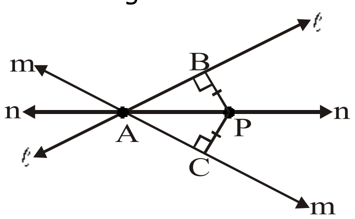
(ii) BE = ED.



(iii) $\angle$ABC = $\angle$ADC. Can we say that AE = EC?

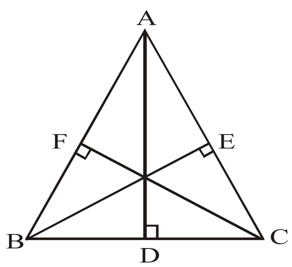
Q.2 AB is a line segment. P and Q are points on opposite sides of AB such that each of them is equidistant from the points A and B. Show that the line PQ is the perpendicular bisector of AB.

Q.3 In fig. P is a point equidistant from the lines ℓ and m intersecting



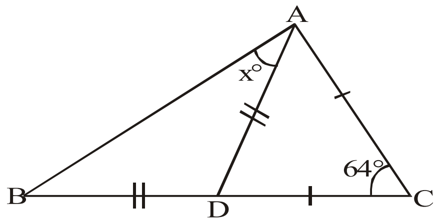
at point A. Show that the line n (along AP) bisects the angle between ℓ and m.

Q.4 AD, BE and CF, the altitudes of ΔABC are equal. Prove that ΔABC



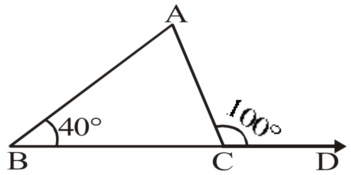
is an equilateral triangle.

Q.5 In the adjoining fig, find the value of x.

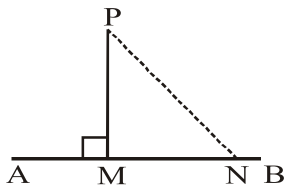


Q.6 In fig, show that :

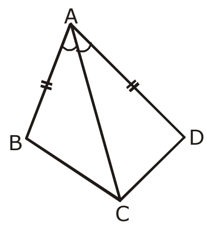
(i) AB > AC (ii) AB > BC and (iii) BC > AC.



Q.7 Show that of all the line segments that can be drawn to a given straight line from a given point outside it, the perpendicular is the shortest.



Q.8 In figure ABCD is a quadrilateral such that AB = AD and AC is bisector of the angle A of the quadrilateral. Show that $\Delta ABC \cong \Delta ADC$ and BC = DC.



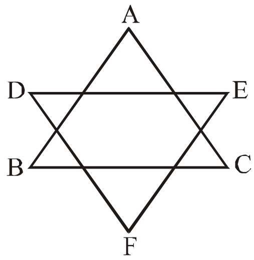
Q.9 In ΔABC, if $\angle$A = 36° and $\angle$B = 64°, name the longest and shortest sides of the triangle.

Q.10 In ΔABC, if $\angle$A = 90°, which is the longest side ?

Q.11 In ΔABC, if $\angle$A = $\angle$B = 45°, name the longest side .

Q.12 Can we draw a triangle ABC with AB = 3 cm, BC = 3.5 and CA = 6.5 cm? Why?

Q.13 In the adjoining figure, find the value of $\angle A + \angle B + \angle C + \angle D + \angle E + \angle F$.

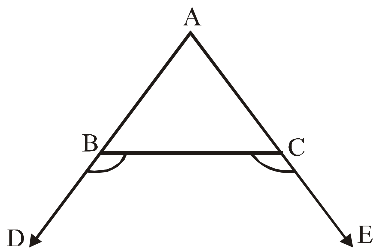


Q.14 In a ΔABC, the angle bisectors of the $\angle ABC$ and the $\angle ACB$ meet at O. If

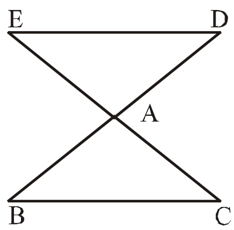
$\angle BAC = 80^o$, find $\angle BOC$.

Q.15 If the sides AB and AC of ΔABC are produced (Fig.) and $\angle DBC < \angle BCE$.

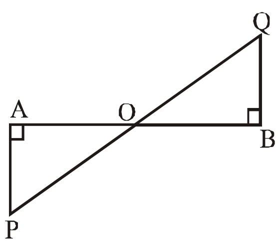
Prove that AC > AB.



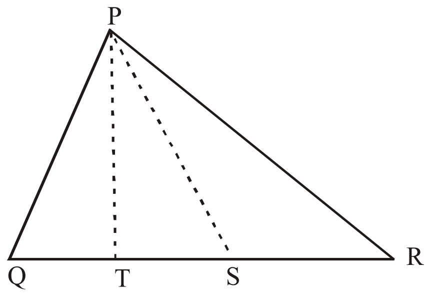
Q.16 In Fig. the sides BA and CA have been produced such that BA = AD and CA = AE. Prove that segment DE || side BC.



Q.17 In Fig. PA $\perp$ AB, QB $\perp$ AB and PA = QB. If PQ intersects AB at O , show that O is the mid-point of AB as well as that of PQ.

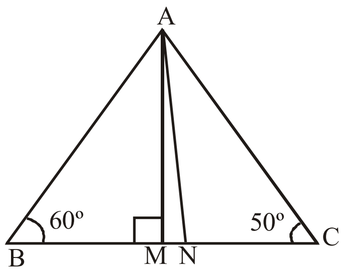


Q.18 In the Fig. PS is the bisector of the $\angle P$ and PT $\perp$ QR, then show that

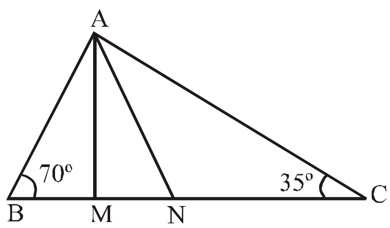


$$\angle TPS = \frac{1}{2}(\angle Q - \angle R)$$

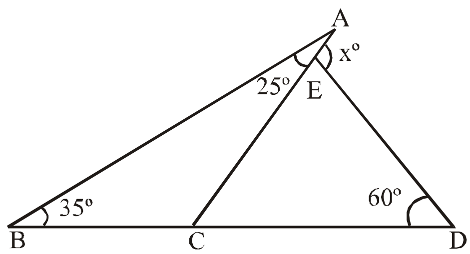
Q.19 In the Fig. AM $\perp$ BC and AN is th angle bisector of $\angle A$ if $\angle B = 60^o$ and $\angle C = 50^o$, find $\angle MAN$.



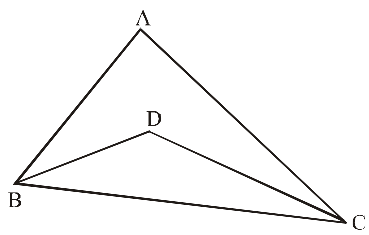
Q.20 In the given figure, AM $\perp$ BC and AN is the bisector of $\angle BAC$. If $\angle B = 70^o$ and $\angle C = 35^o$, find $\angle MAN$.



Q.21 In the figure find the value of x^o.



Q.22 In ΔABC, AC > AB (Fig.) and BD and CD are angle bisectors of $\angle B$ and $\angle C$ respectively. Prove that DC > BD.



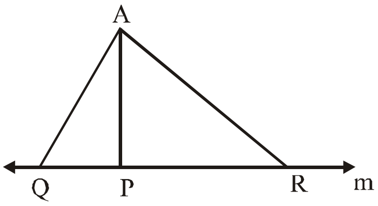
Q.23 Prove that the medians of an equilateral triangle are equal.

Q.24 Angles A, B, C of a triangle ABC are equal to each other. Prove that ΔABC is equilateral.

Q.25 ABCD is a square, X and Y are points on sides AD and BC respectively such that AY = BX. Prove that BY = AX and

$\angle$BAY = $\angle$ABX.

Q.26 In the Fig. AP is the shortest line segment that can be drawn from A to line m. If PR > PQ, prove that AR > AQ.

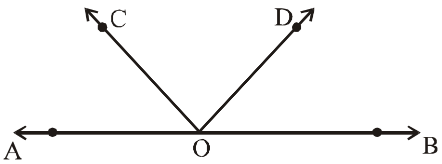


Q.27 In Δ ABC, AC > AB and D is the point on AC such that AB = AD.

Prove that CD < BC

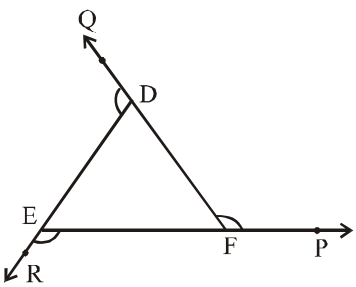
Q.28 Prove that each angle of an equilateral triangle is 60°.

Q.29 In Fig. If $\angle$AOC + $\angle$BOD = 70°, find $\angle$COD.

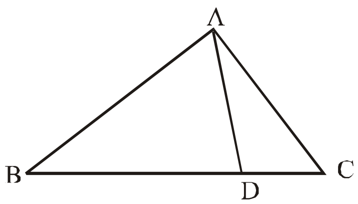


Q.30 In Fig. $\angle$DFP, $\angle$EDQ and $\angle$FER are exterior angles of Δ DEF. Prove that

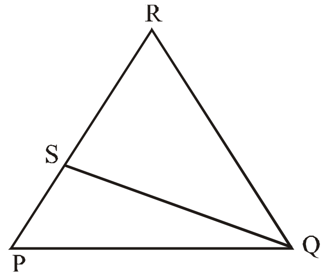
$\angle$ DFP + $\angle$ EDQ + $\angle$ FER = 360°



Q.31 In fig. AB > AC and D is any point on side BC of Δ ABC. Prove that AB > AD.



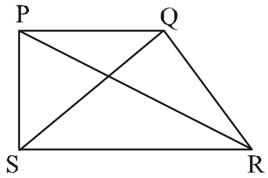
Q.32 In the given figure, PQ = PR. S is any point on the side PR. Prove that : RS < QS.



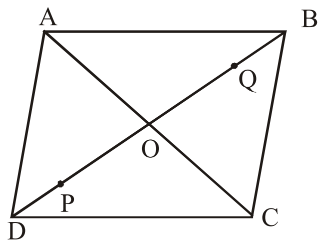
Or

PR and QS are the diagonals of a quadrilateral. PQRS. Prove that

PQ + QR + RS + SP > PR + QS

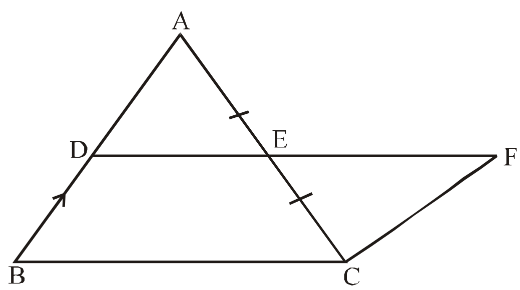


Q.33 In a parallelogram ABCD, two points P and Q are taken on its diagonal BD such that DP = BQ. Prove that PQ and AC bisect each other.



Q.34 (i) Prove that two triangles are congruent if any two angles and the included side of one triangle are respectively equal to any two angles and the included side of the second triangles.

(ii) Using the above theorem, prove that CF = AD in the given figure in which E is the mid-point of AC and CF drawn parallel to DB.



Q.35 An exterior angle of a triangle is 120°. One of the interior opposite angle is 35°. Find the other two angles.

Q.36 Which of the following statements are true (T) and which are false (F).

(i) If two sides of a triangle are unequal then larger side has the smaller angle opposite to it

(ii) If two angles of a triangle are unequal, then side opposite to smaller side is larger.

(iii) Sum of two sides of a triangle is greater than third side.

(iv) The difference of two sides of a triangle is equal to the third side.

(v) Of all the line-segments that can be drawn from a point outside a line, the perpendicular is the shortest.

(vi) The sum of three sides of a triangle is less than the sum of its three medians.

Q.37 Fill in the blanks to make the following statements true.

(i) Sum of any two sides of a triangle is ....than the third side.

(ii) If two sides of a triangle are unequal then the smaller angle has the .... side opposite to it.

(iii) Of all the line-segments drawn from a point to a line not containing it the .... line-segment is the shortest.

(iv) Difference of any two sides of a triangle is .... than the third side.

(v) If two sides of a triangle are unequal then the larger side has the .... angle opposite to it.

(vi) The sum of the three altitudes of a triangle is .... than its perimeter.

(vii) The perimeter of a triangle is .... than the sum of its medians.

(viii) In a right-triangle the hypotenuse is ....

ANSWER KEY

5. $x = 29^\circ$. **9.** AB, BC

10. BC **11.** AB **12.** Yes

13. 360° **14.** 130° **19.** 5°

20. 17.5° **21.** 120°

29. 110° **35.** $85^\circ, 60^\circ$

37. (i) F (ii) F (iii) T

(iv) F (v) T (vi) F

37. (i) greater (ii) smaller

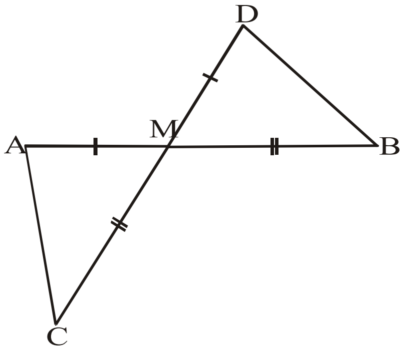
(iii) perpendicular (iv) less

(v) greater (vi) less

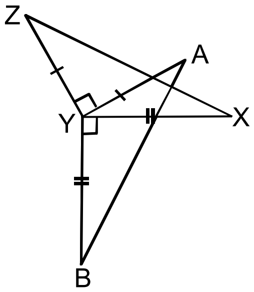
(vii) greater (viii) longest

EXERCISE – II | SCHOOL EXAM/BOARD

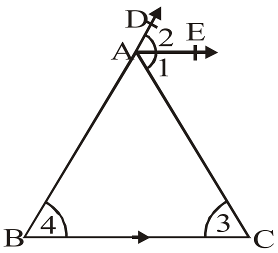
Q.1 In the given fig, the line segments AB and CD intersect at a point M in such a way that AM = MD and CM = MB. Prove that, AC = BD but AC may not be parallel to BD.



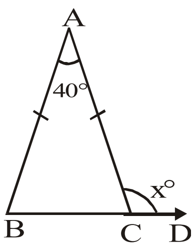
Q.2 In the given fig. AY ⊥ ZY and BY ⊥ XY such that AY = ZY and BY = XY. Prove that AB = ZX.



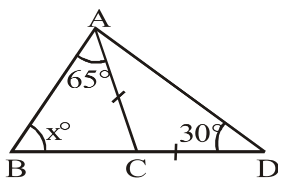
Q.3 If the bisector of the exterior vertical angle of a triangle is parallel to the base, show that the triangle is isosceles.



Q.4 In each of the following figures, find the value of x:

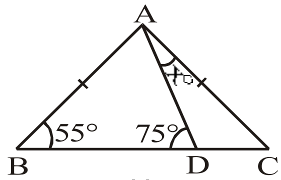


(i)

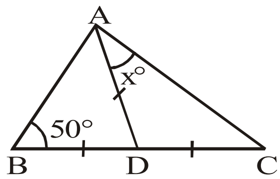


(ii)

Q.5 In each of the following figures, find the value of x:

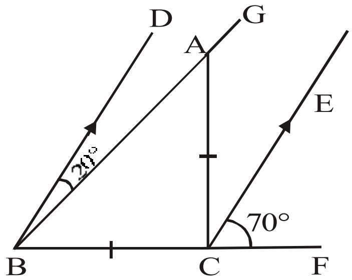


(i)

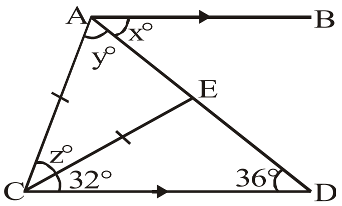


(ii)

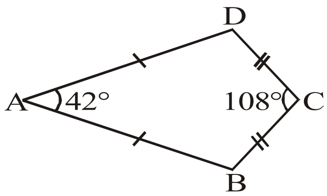
Q.6 In the given fig, BD||CE; AC = BC, ∠ABD = 20° and ∠ECF = 70°. Find ∠GAC.



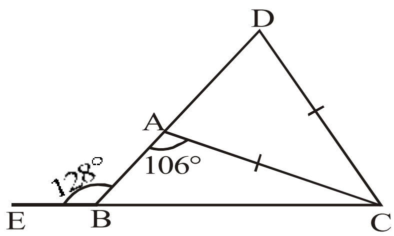
Q.7 In the given figure, AB||CD and CA = CE. Find the values of x, y and z.



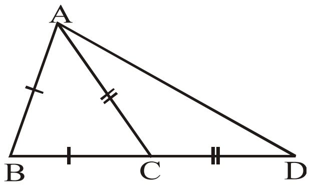
Q.8 In the given figure, AB = AD; CB = CD; ∠A = 42° and ∠C = 108°, find ∠ABC.



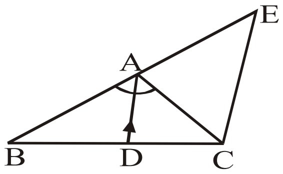
Q.9 In the given figure, side BA of ΔABC has been produced to D such that CD = CA and side CB has been produced to E. If ∠BAC = 106° and ∠ABE = 128°, find ∠BCD.



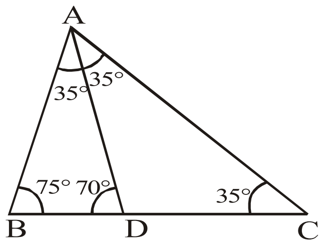
Q.10 In the given figure, AB = BC and AC = CD. Show that ∠BAD : ∠ADB = 3 : 1.



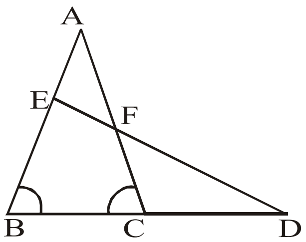
Q.11 In the given figure, AD is the internal bisector of ∠A and CE⁻DA. If CE meets BA produced at E, prove that ΔCAE is isosceles.



Q.12 In the given figure, AD bisects ∠A. Arrange AB, BD and DC in ascending order.



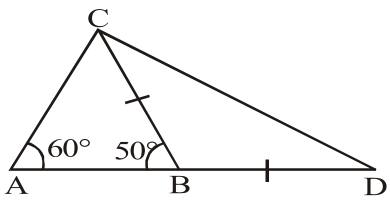
Q.13 In the given fig. AB = AC. Prove that : AF > AE.



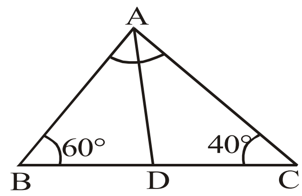
Q.14 In the given figure, side AB of ΔABC is produced to D such that BD = BC.

If ∠A = 60° and ∠B = 50°, prove that :

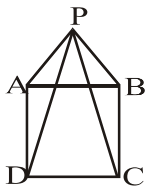
(i) AD > CD (ii) AD > AC



Q.15 In the given figure, AD bisects ∠A. If ∠B = 60°, ∠C = 40°, then arrange AB, BD and DC in ascending order of their lengths.



Q.16 In the given fig, ABCD is a square and ΔPAB is an equilateral triangle.

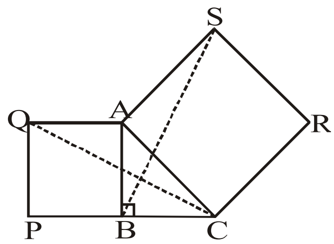


(i) Prove that ΔAPD ≅ ΔBPC.

(ii) Show that ∠DPC = 15°.

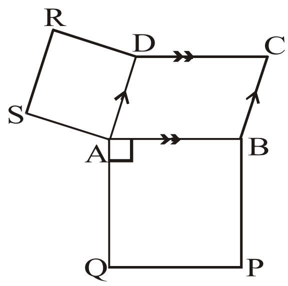
Q.17 In the given fig, in ΔABC, ∠B = 90°. if ABPQ and ACRS are squares, prove that :

(i) ΔACQ ≅ ΔABS. (ii) CQ = BS.



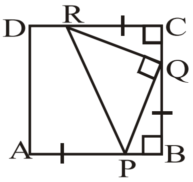
Q.18 Squares ABPQ and ADRS are drawn on the sides AB and AD of a parallelogram ABCD. Prove that:

(i) ∠SAQ = ∠ABC (ii) SQ = AC.



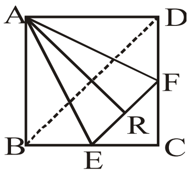
Q.19 In the given fig, ABCD is a square and P, Q, R are points on AB, BC and CD respectively such that AP = BQ = CR and ∠PQR = 90°. Prove that:

(i) PB = QC, (ii) PQ = QR, (iii) $\angle QPR = 45°$.

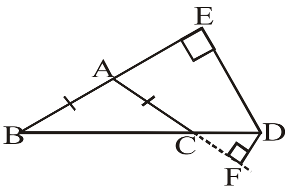


Q.20 In the given fig, ABCD is a square, EF||BD and R is the mid-point of EF. Prove that :

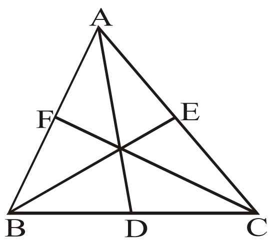
(i) BE = DF (ii) AR bisects $\angle BAD$
(iii) If AR is produced, it will pass through C.



Q.21 In a ΔABC, AB = AC and BC is produced to D. From D, DE is drawn perpendicular to BA produced and DF is drawn perpendicular to AC produced. Prove that BD bisects $\angle EDF$.



Q.22 Prove that the perimeter of a triangle is greater than the sum of its three medians.

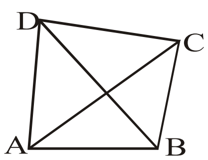


Q.23 In the adjoining figure, prove that :

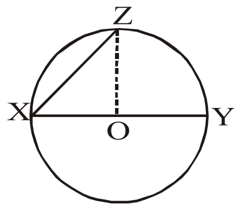
(i) AB + BC + CD > DA

(ii) AB + BC + CD + DA > 2AC
(iii) AB + BC + CD + DA > 2BD

(iv) AB + BC + CD + DA > AC + BD

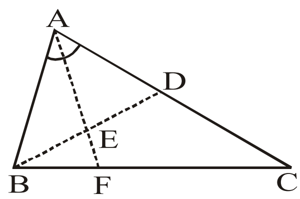


Q.24 In the adjoining figure, O is the centre of a circle, XY is a diameter and XZ is a chord. Prove that XY > XZ.



Q.25 In the given figure, AD = AB and AE bisects $\angle A$. Prove that :

(i) BE = ED **(ii)** $\angle ABD > \angle BCA$.



Answers

4. (i) 110, **(ii)** 55
5. (i) 20, **(ii)** 40
6. 130°
7. x = 36, y = 68, z = 44
8. 105°
9. 54°
12. BD < AB < DC
15. BD = DC < AB

EXERCISE – III MULTIPLE CHOICE QUESTIONS

Q.1 Which of the following is not a criterion for congruence of triangles?
(A) SSA (B) SAS (C) ASA (D) SSS

Q.2 If AB = QR, BC = RP and CA = PQ, then which of the following holds?
(A) $\Delta ABC \cong \Delta PQR$ (B) $\Delta CBA \cong \Delta PQR$
(C) $\Delta CAB \cong \Delta PQR$ (D) $\Delta BCA \cong \Delta PQR$

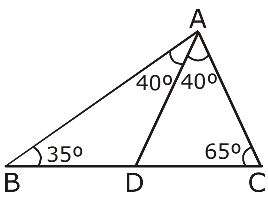
Q.3 If $\Delta ABC \cong \Delta PQR$ and ΔABC is not congruent to ΔRPQ, then which of the following is not true?
(A) BC = PQ (B) AC = PR
(C) BC = QR (D) AB = PQ

Q.4 It is given that $\Delta ABC \cong \Delta FDE$ in which AB = 5 cm, $\angle B = 40^o$, $\angle A = 80^o$ and FD = 5 cm. Then, which of the following is true?
(A) $\angle D = 60^o$ (B) $\angle E = 60^o$
(C) $\angle F = 60^o$ (D) $\angle D = 80^o$

Q.5 In $\angle ABC$, AB = 2.5 cm and BC = 6 cm. Then, the length of AC cannot be
(A) 3.4 cm (B) 4 cm
(C) 3.8 cm (D) 3.6 cm

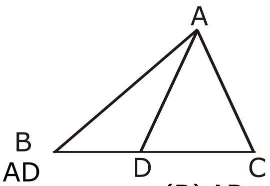
Q.6 In ΔABC, $\angle A = 40^o$ and $\angle B = 60^o$. Then, the longest side of ΔABC is
(A) BC (B) AC
(C) AB (D) cannot be determined

Q.7 In ΔABC, $\angle B = 35^o$, $\angle C = 65^o$ and the bisector AD of $\angle BAC$ meets BC at D. Then, which of the following is true?



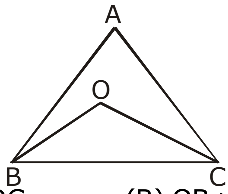
(A) AD > BD > CD (B) BD > AD > CD
(C) AD > CD > BD (D) None of these

Q.8 In the given figure, AB > AC. Then which of the following is true?



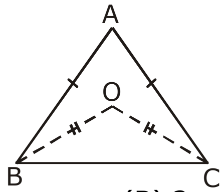
(A) AB < AD (B) AB = AD
(C) AB > AD (D) Cannot be determined

Q.9 In the given figure, AB > AC. If BO and CO are the bisectors of $\angle B$ and $\angle C$ respectively, then



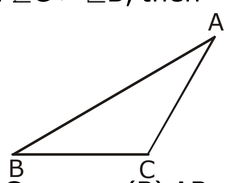
(A) OB = OC (B) OB > OC
(C) OB < OC (D) None of these

Q.10 In the given figure, AB = AC and OB = OC. Then $\angle ABO : \angle ACO$ = ?



(A) 1 : 1 (B) 2 : 1
(C) 1 : 2 (D) None of these

Q.11 In ΔABC, if $\angle C > \angle B$, then

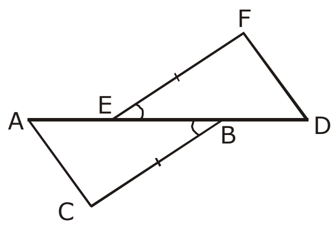


(A) BC > AC (B) AB > AC
(C) AB < AC (D) BC < AC

Q.12 O is any point in the interior of ΔABC. Then, which of the following is true?
(A) (OA + OB + OC) > (AB + BC + CA)
(B) (OA + OB + OC) > $\frac{1}{2}$(AB + BC + CA)
(C) (OA + OB + OC) < $\frac{1}{2}$(AB + BC + CA)
(D) None of these

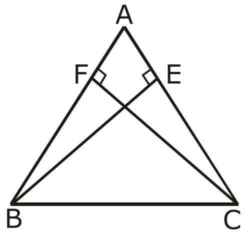
Q.13 If the altitudes from two vertices of a triangle to the opposite sides are equal, then the triangle is
(A) equilateral (B) isosceles
(C) scalene (D) right-angled

Q.14 In the given figure, AE = DB, CD = EF and $\angle ABC = \angle FED$. Then, which of the following is true?



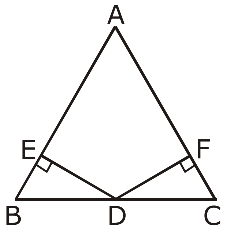
(A) $\Delta ABC \cong \Delta DEF$ (B) $\Delta ABC \cong \Delta EFD$
(C) $\Delta ABC \cong \Delta FED$ (D) $\Delta ABC \cong \Delta EDF$

Q.15 In the given figure, BE $\perp$ CA and CF $\perp$ BA such that BE = CF. Then, which of the following is true?



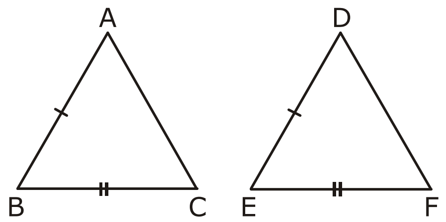
(A) $\Delta ABC \cong \Delta ACF$ (B) $\Delta ABE \cong \Delta AFC$
(C) $\Delta ABC \cong \Delta CAF$ (D) $\Delta ABC \cong \Delta FAC$

Q.16 In the given figure, D is the midpoint of BC, DE $\perp$ AB and DF $\perp$ AC such that DE = DF. Then, which of the following is true?



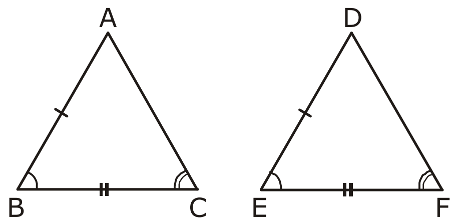
(A) AB = AC (B) AC = BC
(C) AB = BC (D) None of these

Q.17 In ΔABC and ΔDEF, it is given that AB = DE and BC = EF. In order that $\Delta ABC \cong \Delta DEF$, we must have



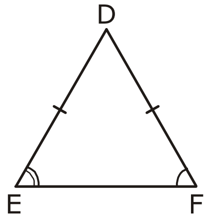
(A) $\angle A = \angle D$ (B) $\angle B = \angle E$
(C) $\angle C = \angle F$ (D) none of these

Q.18 In ΔABC and ΔDEF, it is given that $\angle B = \angle E$ and $\angle C = \angle F$. In order that $\Delta ABC \cong \Delta DEF$, we must have



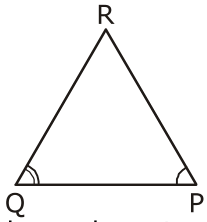
(A) AB = DE (B) AC = DE
(C) BC = EF (D) $\angle A = \angle D$

Q.19 In ΔABC and ΔPQR, it is given that AB = AC, $\angle C = \angle P$ and $\angle B = \angle Q$. Then, the two triangles are



(A) isosceles but not congruent
(B) isosceles and congruent
(C) congruent but not isosceles
(D) neither congruent nor isosceles

Q.20 Which is true?



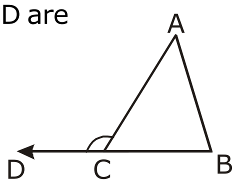
(A) A triangle can have two right angles
(B) A triangle can have two obtuse angles
(C) A triangle can have two acute angles.
(D) An exterior angle of a triangle is less than either of the interior opposite angles.

Q.21 An exterior angle of a triangle is equal to the sum of two ______ angles.
(A) exterior opposite (B) interior opposite
(C) interior (D) opposite

Q.22 In the following, the set of measures which can form a triangle
(A) 70º, 90º, 25º (B) 65º, 85º, 40º
(C) 65º, 85º, 30º (D) 45º, 45º, 80º

Q.23 Sum of any two sides of a triangle is always ____ third side in a triangle
(A) less than (B) equal to
(C) greater than (D) none

Q.24 The interior opposite angles of the exterior angle $\angle ACD$ are

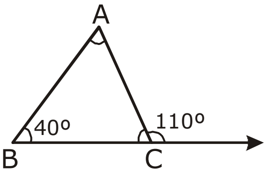


(A) $\angle B, \angle C$ (B) $\angle A, \angle C$
(C) $\angle A, \angle B$ (D) $\angle B, \angle E$

Q.25 Can 90º, 90º and 20º form a triangle?
(A) Yes (B) Sometimes
(C) No (D) None

Q.26 Can 6 cm, 5 cm and 3 cm form a triangle?
(A) Yes (B) No
(C) Sometimes (D) None

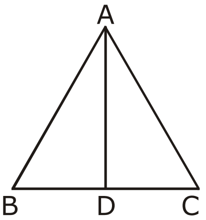
Q.27 An exterior angle of a triangle is 110º and one of the interior of opposite angles is 40º. Then the other two angles of a triangle are



(A) 70º, 70º (B) 70º, 40º
(C) 110º, 40º (D) 110º, 75º

Q.28 In a right angled triangle, the square of the hypotenuse is eqal to twice the product to the other two sides. One of the acute angles of the triangle is
(A) 60º (B) 45º (C) 30º (D) 75º

Q.29 In the given figure AD is the bisector of $\angle A$ and AB = AC. Then ΔACD, ΔADB are congruent by which criterion?

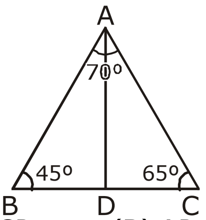


(A) SSS (B) SAS (C) ASA (D) None

Q.30 In ΔABC if $\angle B = \angle C = 45º$, which of the following is the longest side?
(A) AB (B) AC (C) BC (D) None

Q.31 In a ΔABC if $\angle A = 45º$ and $\angle B = 70º$ then the shortest and the largest sides of the triangle are
(A) AB, AC (B) BC, AC
(C) AB, AC (D) none

Q.32 In ΔABC $\angle B = 45º$, $\angle C = 65º$, and the bisector of $\angle$BAC meets BC at P. Then the ascending order of sides is



(A) AP, BP, CP (B) AP, CP, BP
(C) BP, AP, CP (D) CP, BP, AP

Q.33 In a ΔABC if $2\angle A = 3\angle B = 6\angle C$ then $\angle A$, $\angle B$, $\angle C$ are
(A) 30º, 60º, 90º (B) 90º, 60º, 30º
(C) 30º, 90º, 60º (D) none of these

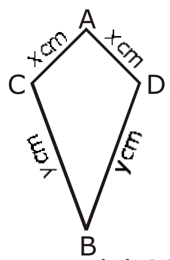
Q.34 A, B, C are three angles of a triangle. If A – B = 15º, B – C = 30º then $\angle A$, $\angle B$, $\angle C$ are
(A) 80º, 65º, 35º (B) 65º, 80º, 35º
(C) 35º, 80º, 65º (D) 80º, 35º, 65º

Q.35 Two sides of a Δle are 7 and 10 units. Which of the following length can be the length of the third side?
(A) 19 cm (B) 17 cm
(C) 13 cm (D) 3 cm

Q.36 If a, b and c are the sides of Δle, then
(A) a – b > c (B) c > a + b
(C) c = a + b (D) b < c + a

Q.37 Which of the following statement is correct?
(A) The different of any two sides is less than the third side
(B) A Δle cannot have two obtuse angles
(C) A Δle cannot have an obtuse angle and a right angle
(D) All the above

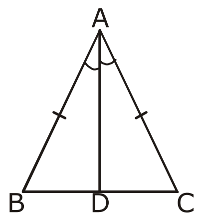
Q.38 By which congruency property, the two triangles connected by the following figure are congruent



(A) SAS property (B) SSS property
(C) RHS property (D) ASA property

Q.39 In ΔABC, AB = AC and AD is perpendicular to BC. State the property by which $\Delta ADB \cong ADC$.
(A) SAS property (B) SSS property
(C) RHS property (D) ASA property

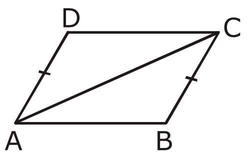
Q.40 State the property by which $\Delta ADB \cong \Delta ADC$ in the following figure,



(A) SAS property (B) SSS property
(C) RHS property (D) ASA property

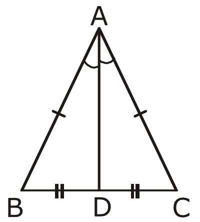
Q.41 In ΔABC, $AD \perp BC$, $\angle B = \angle C$ and $AB = AC$. State by which property $\Delta ADB \cong \Delta ADC$?
(A) SAS property (B) SSS property
(C) RHS property (D) ASA property

Q.42 In the given figure if AD = BC and AD || BC, then



(A) AB = AD (B) AB = DC
(C) BC = CD (D) none

Q.43 In the following figure, if AB = AC and BD = DC than $\angle ADC$ =



(A) 60° (B) 120° (C) 90° (D) none

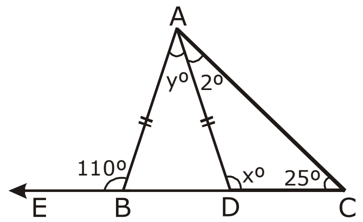
Q.44 If two Δ les have their corresponding angles equal, then they are always congruent.
(A) True
(B) False
(C) Cannot be determined
(D) None

Q.45 If A : Two Δles are said to be congruent if two sides and an angle of the one triangle are respectively equal to the two sides and an angle of the other and R : two Δles are congruent if two sides and the included angle of the one must be equal to the corresponding two sides and included angle of the other, then which of the following statement is correct?
(A) A is false and R is the correct explanation of A
(B) B is true and R is the correct explanation of A
(C) A is true and R is false
(D) None of these

Q.46 Which of the following statements is true?
(A) Two line segements having the same length are congruent
(B) Two squares having the same side length are congruent.
(C) Two circles having the same radius are congruent
(D) All the above

Q.47 Which of the following statement(s) is/are false?
(A) Two Δles having same area are congruent
(B) If two sides and one angle of a Δle
(C) If the hypotenuse of one right triangle is equal to the hypotenuse of another triangle, then the triangles are congruent
(D) All the above

Q.48 In the given below, find $\angle Z$



(A) 40° (B) 110° (C) 45° (D) None

Q.49 Following is not a congruence condition of triangles–
(A) ASA (B) SAS (C) AAS (D) AAA

Q.50 If $\Delta ABC \cong \Delta DCB$ then which of the following is not true
(A) $\angle B = \angle C$
(B) AB = DC
(C) BC is the common side of two triangles
(D) none of these

Q.51 Two right angled triangles having common hypotenuse will not be congruent if they have
(A) one side other than hypotenuse equal
(B) one acute angle equal
(C) both acute angles equal
(D) none of these

Q.52 A boy is running is such a way that he remains at the same distance from two poles fixed at points A and B respectively. The path followed by the boy is
(A) any straight line
(B) any straight line perpendicular to AB
(C) a straight line which is perpendicular bisector of AB
(D) none of these

Q.53 Let l and m are two intersecting lines. Let p be a line every point on which is equidistant from l and m. Then p must be
(A) any line passing through intersection point of l and m
(B) a line not passing through the point of intersection of l and m
(C) a line bisecting the angle between l and m
(D) none of these

Q.54 In ΔABC, $\angle B = 90^o$ and M is the mid point of AC. Then following is true
(A) AC is hypotenuse of ΔABC
(B) $\angle A = \angle CBM$
(C) AM = BM
(D) all are true

Q.55 In an isosceles triangle ABC, for median AD, the correct statement is that
(A) it bisects the side BC
(B) it is perpendicular to BC
(C) it bisects $\angle A$
(D) all are correct

Q.56 A triangle ABC is not isosceles if
(A) any two altitudes of Δ are equal
(B) any two medians of Δ are equal
(C) any two angles of Δ are equal
(D) none of these

Q.57 If the sides of a triangle are 4 cm, 6 cm and 10 cm then
(A) Δ is obtuse angled
(B) Δ is acute angled
(C) Δ is right angled
(D) Δ is not possible

Q.58 The angle B of a ΔABC is 90^o and AC = 4 cm. If D is the mid point of AC, then length BD is
(A) 4 cm
(B) 2 cm
(C) 3 cm
(D) cannot be found with given data

Q.59 If any triangle the difference of two sides is always
(A) greater than the third side
(B) less than the third side
(C) equal to the third side
(D) twice the third side

Q.60 If sum of three sides of a triangle be x and the sum of three medians of the same triangle by y, then
(A) $x > y$ (B) $x < y$
(C) $x > \frac{2}{3}y$ (D) $x \le y$

Q.61 In a right angled triangle, hypotenuse is
(A) a side opposite to an acute angle
(B) the longest side
(C) any side of Δ
(D) none of these

Q.62 I is a point in the interior of ΔABC, whose distances from sides AB and AC is x. Then distance of I from BC is
(A) x (B) $\frac{x}{2}$
(C) x (D) cannot be found with given data

Q.63 O is any point, not on the boundary of ΔABC, then
(A) OA + OB + OC = AB + BC + CA
(B) OA + OB + OC > AB + BC + CA
(C) $OA + OB + OC > \frac{1}{2}(AB + BC + CA)$
(D) $OA + OB + OC = \frac{1}{2}(AB + BC + CA)$

Q.64 In each of the following cases, lengths of three sides of a triangle are given, then in which case triangle is possible?
(A) 7, 3, 4 (B) 16, 11, 4
(C) 5, 12, 3 (D) none of these

Q.65 Two canals include an angle of 60^o when they are constructed to take water from a dam. The locus of the point at equal distances from the canal, is
(A) a point on the canal
(B) any line through common point of the canals
(C) bisector of the angle between the canals
(D) none of these

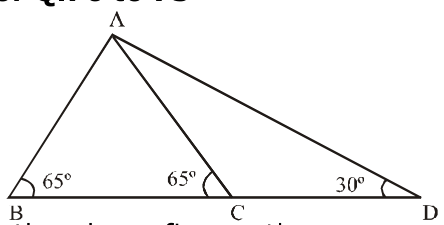
Q.66 In ΔABC, AD is altitude. Then perimeter of ΔABC is
(A) greater than twice the altitude
(B) equal to twice the altitude
(C) equal to thrice the altitude
(D) none of these

Q.67 ΔABC, $\angle B = 35^o$, $\angle C = 65^o$ and the bisector of $\angle BAC$ meets BC in X. Then
(A) AX > BX > CX (B) BX > AX > CX
(C) AX < BX < CX (D) BX < AX > CX

Q.68 In ΔABC, AC > AB and AD is the bisector of $\angle A$ where D lies on BC. Then
(A) $\angle ADC > \angle ADB$ (B) $\angle ADC < \angle ADB$
(C) $\angle ADC = \angle ADB$ (D) $\angle B < \angle C$

Q.69 If the sides of a triangle are in the ratio 5 : 4 : 3, then the respective altitudes on them will be in the ratio -
(A) 3 : 4 : 5 (B) 5 : 4 : 3
(C) 20 : 15 : 6 (D) 12 : 15 : 20

Figure for Q.70 to 73



Q.70 In the above figure, the measure of $\angle BAC$ is-
(A) 65^o (B) 50^o (C) 55^o (D) 60^o

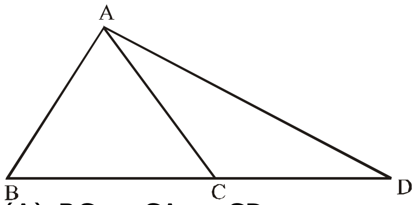
Q.71 In the above figure, the measure of $\angle ACD$ is-
(A) 125^o (B) 120^o (C) 105^o (D) 115^o

Q.72 In the figure above, which of the following is true -
(A) BC < CA < CD
(B) BC < CA > CD
(C) BC = CA > CD
(D) BC > CA = CD

Q.73 In the above figure the measure of $\angle CAD$ is -
(A) 45º (B) 35º (C) 25º (D) 15º

Q.74 The sum of exterior angles of a triangle is-
(A) 180º (B) 270º
(C) 360º (D) 540º

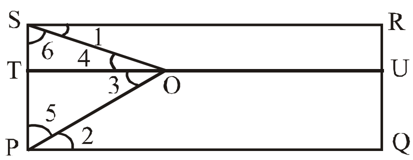
Q.75 In the adjoining figure, if $\angle B = \angle ACB = 65º$ and $\angle D = 30º$, then -



(A) BC > CA > CD
(B) AB = CA < CD
(C) BC < CA, CA > CD
(D) BC > CA, CA < CD

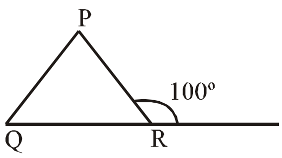
Q.76 If two sides of a triangle are 6 cm and 8 cm, then the length of the third side is -
(A) 7 cm
(B) 2 cm
(C) greater than 2 cm and less than 14 cm
(D) none of these

Q.77 In this figure, PQ || TU || SR. Which of the following is true -



(A) $\angle 1 + \angle 2 = \angle 3 + \angle 4$
(B) $\angle 1 + \angle 2 = \angle 5 + \angle 6$
(C) $\angle 1 + \angle 3 = \angle 2 + \angle 4$
(D) All are ture

Q.78 In ΔPQR, PQ = PR, $\angle QPR$ is equal to –



(A) 20º (B) 30º
(C) 40º (D) 50º

Q.79 The number of triangles with any three of the lengths 1, 4, 6 and 8 cms is -
(A) one (B) two
(C) three (D) four

Q.80 If one angle of a triangle is equal to half the sum of the other two equal angles, then the triangle is -
(A) isosceles (B) scalene
(C) equilateral (D) right angled

Answers

1.	A	**2.**	C	**3.**	A	**4.**	B
5.	A	**6.**	C	**7.**	B	**8.**	C
9.	B	**10.**	A	**11.**	B	**12.**	B
13.	B	**14.**	A	**15.**	A	**16.**	A
17.	B	**18.**	C	**19.**	A	**20.**	C
21.	B	**22.**	C	**23.**	C	**24.**	C
25.	C	**26.**	A	**27.**	A	**28.**	B
29.	A	**30.**	C	**31.**	B	**32.**	D
33.	B	**34.**	A	**35.**	C	**36.**	D
37.	D	**38.**	B	**39.**	C	**40.**	A
41.	D	**42.**	B	**43.**	C	**44.**	B
45.	A	**46.**	D	**47.**	D	**48.**	C
49.	D	**50.**	D	**51.**	D	**52.**	C
53.	C	**54.**	D	**55.**	D	**56.**	D
57.	D	**58.**	B	**59.**	B	**60.**	A
61.	B	**62.**	A	**63.**	C	**64.**	D
65.	C	**66.**	A	**67.**	B	**68.**	A
69.	D	**70.**	B	**71.**	D	**72.**	A
73.	B	**74.**	C	**75.**	B	**76.**	C
77.	A	**78.**	A	**79.**	A	**80.**	C